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| 10/039,635 | 01/02/2002 | Charles T. Black | YOR9-2001-0319-US1 | 9290 |

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03/09/2007

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| EXAMINER |
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JOHNSTON, PHILLIP A

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| ART UNIT | PAPER NUMBER |
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2881

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/039,635

Applicant(s)

BLACK ET AL.

Examiner

Phillip A. Johnston

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18,21-29,31,32,37-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18,21-29,31,32 and 37-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

Detailed Action

1. This Office Action is submitted in response to the appeal brief filed 4-26-2006, wherein claims 1-18,21-29,31,32,37-42 are pending.

2. The examiner agrees with those arguments presented in the applicants appeal brief regarding the examiners failure to clearly point out each and every limitation of the applicants claimed invention. As a result, the rejection in the previous Office Action is withdrawn, and a new Office Action is submitted below which will more clearly define the examiners position.

Claims Rejection – 35 U.S.C. 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-18,21-29,31,32,37-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Pub. No. 2004/0131843 to Mirkin, and Mirkin, U.S. Patent No. 6,827,979.

5. Regarding claims 1 and 37, Mirkin (843) teaches dipping an SPM probe tip into a patterning compound in solution, containing oligonucleotide-nanoparticle conjugates, which are 30 nm diameter spherical gold nanoparticles (spherical implying the length differs from the width by less than 15%). See [0016] and [0018]. It is important to point out here that oligonucleotide-nanoparticle conjugates by definition

are nanoparticles coated with oligonucleotides (encapsulating each nanoparticle). See USPN 6,361,944 to Mirkin.

After dipping the SPM tip into solution, the oligonucleotide coated nanoparticles are applied to a substrate (note Figure 1) by meniscus force nanografting; i.e., nanoparticle coated tip is forced through a resist coated surface, allowing the oligonucleotide coated gold nanoparticles to bind to the newly exposed surface. See paragraph's [0053], [0097], [0103]. The tip is used to form a desired pattern, which may be a single nanoparticle dot, line, or geometric shape. See [0076].

6. Mirkin (843) teaches all the required limitations of claims 1 and 37, as pointed out above.

7. Mirkin (843) fails to disclose the use of an adhesion layer.

8. Mirkin (979) teaches applying an adhesion layer to an SPM tip before dipping into the nanoparticle solution (the adhesion layer is between the tip and the nanoparticles). Col. 7, line 15-34.

9. Mirkin (979) modifies the Mirkin (843) device to provide an adhesion layer to improve the physisorption of the patterning compound to the tip.

10. Therefore it would have been obvious to one of ordinary skill in the art that the SPM tip of Mirkin (843) can use the adhesion coating of Mirkin (979) to provide a patterning compound that adheres to the tip surface.

11. Regarding claim 38, the rationale applied above to claims 1 and 37 also applies to claim 38. Mirkin (843) also teaches at paragraph [0043], the use of amino-siloxane compounds, and monolayer coatings applied to the tip. See paragraph

[0003]. The combination of Mirkin (979) and Mirkin (843) fails to teach varying nanoparticle coating thickness over the range 0.5 to 5 nm. The examiner takes official notice that it is well known in the art that nanoparticle coating thickness can be varied within the range of .5 to 5 nm, using conventional techniques. See US Pat. Pub. No. 2002/0177143 to Mirkin. Therefore one of ordinary skill would use conventional techniques to coat nanoparticles of a desired thickness dictated by the choice of materials and tip sizes.

12. Regarding claim 42, the rational applied above to claim 38 also applies to claim 42.

13. Regarding claims 2 and 39, the rational applied above to claims 1 and 38 also applies to claims 2 and 39. Mirkin (843) also teaches the use of an AFM. See [0022].

14. Regarding claims 3 and 40, the rational applied above to claims 1 and 38 also applies to claims 3 and 40. The combination of Mirkin (979) and Mirkin (843) fails to teach the use of semiconductor nanoparticle materials. However, the examiner takes official notice that it is well known in the art to use semiconductor nanoparticle materials. See USPN 6,361,944 to Mirkin. Therefore one of ordinary skill would utilize semiconductor nanoparticles as dictated by the choice of materials to be patterned.

15. Regarding claim 4, the rational applied above to claims 1 and 38, also applies to claim 4.

16. Regarding claim 5, the rational applied above to claims 1 and 38, also applies to claim 5.

17. Regarding claim 6, the rational applied above to claim 1, also applies to claim 6.

18. Regarding claims 8 and 9, the rational applied above to claim 1, also applies to claims 8 and 9.

19. Regarding claims 10 and 25, the rational applied above to claims 1 and 37, also apply to the structural limitations of claims 10 and 25. Mirkin (843) also teaches that the size of the pattern area covered is dependent upon the size and viscosity of the drop, but fails to teach coating the tip apex. However, one of ordinary skill would adjust the size of the drop to cover the apex of the tip in order to adjust the amount of area that is covered by the patterning compound, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

20. Regarding claim 24, Merkin (843) teaches all the structural limitations therein, but fails to teach the use of a sacrificial layer. The combination of Mirkin (979) and Mirkin (843) fails to teach the use of a sacrificial layer. However, it is well known in the art to provide a sacrificial layer on a probe tip. See USPN 6,413,440 to Igel. Therefore one of ordinary skill would have utilized a sacrificial layer in order to isolate a specific area on the tip.

21. Regarding claim 26, the rational applied above to claims 1 and 37 also applies to the structural limitations of claim 26. Merkin (843) fails to teach the use of an elastomer for inking. It would have been obvious to use an elastomeric substrate, since it have been held to be within the ordinary skill of worker in the art to select a

known material on the basis of its suitability for the intended use. One would have been motivated to use an elastomeric substrate for the purpose of applying a pattern thereto.

22. Regarding claim 27, the rationale applied above to claims 1 and 37 also applies to the structural limitations of claim 27. Merkin (843) also teaches the use of nonvolatile patterning compounds such as glucose, which is also nonvolatile in the solutions taught.

23. Regarding claim 28, Merkin (843) teaches all the structural limitations therein, but fails to teach the use of an electrochemical solution. The combination of Mirkin (979) and Merkin (843) fails to teach applying electrical potentials to the probe in an electrochemical solution. However, it is well known in the art to dip the probe tip into an electrochemical solution and apply electrical potentials to the probe. See US Pat. Pub. No. 2003/0106998 to Colbert. Therefore one of ordinary skill would choose to utilize electrochemical techniques to apply coatings based upon the nanoparticle and tip materials selected.

24. Regarding claims 7 and 16, the rationale applied above to claims 10 and 25, as well as claim 38, also applies to claims 7 and 16.

25. Regarding claim 11, the rationale applied above to claims 10 and 25, as well as claim 38, also applies to claim 11.

26. Regarding claim 12, the rationale applied above to claims 10 and 25, as well as claim 26, also applies to claim 12.

27. Regarding claim 13, the rational applied above to claims 10 and 25, as well as claim 27, also applies to claim 13.

28. Regarding claim 14, the rational applied above to claims 10 and 25, also applies to claim 14. Also Mirkin (843) teaches applying an electric potential to the probe tip. See Mirkin (843) paragraph [0080].

29. Regarding claim 15, the rational applied above to claims 10 and 25, as well as claim 28, also applies to claim 15.

30. Regarding claims 17 and 18, the rational applied above to claims 10 and 25, also applies to claims 17 and 18.

31. Regarding claim 20, the rational applied above to claims 10 and 25, also applies to claim 20.

32. Regarding claims 21-23, the combination of Mirkin (843) and Mirkin (899) fails to teach the annealing techniques claimed therein. However, annealing of nanoparticle coatings is well known in the art. See US Pat. Pub. No. 2003/0106998 to Colbert. Therefore one of ordinary skill would routinely utilize annealing to provide strong, reliably mounted probe tips thereby improving conventional microscopy techniques.

33. Regarding claim 29, the rational applied above to claim 28, also applies to claim 29.

34. Regarding claims 31, the combination of Mirkin (843) and Mirkin (899) discloses the claimed invention but fails to teach the use of cobalt nanoparticles. However, cobalt nanoparticles are well known in the art. See 6,254,662 to Murray.

Therefore one of ordinary skill would have been motivated to use cobalt for the purpose of forming a magnetic alloy nanoparticle film.

35. Regarding claim 32, the rational applied above to claim 1, also applies to claim 32. Also Mirkin (843) teaches the use of surfactants, which would include oleic acid.

36. Regarding claim 41, the rational applied above to claim 38, also applies to claim 41.

Conclusion

37. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor Robert Kim can be reached at (571) 272-2293. The fax phone number for the organization where the application or proceeding is assigned is 703 872 9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should


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you have questions on access to the Private PAIR system, contact the Electronic
Business Center (EBC) at 866-217-9197 (toll-free).

PJ

November 28, 2006


Primary Examiner
Art Unit 2881


ROBERT KIM
SUPERVISORY PATENT EXAMINER